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TRANSMITTAL FORM

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First Named Inventor	Edward McGugan
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ENCLOSURES *(check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
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- ☒ Certified Copy of Priority Document(s)
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  - Return Receipt Postcard;

Remarks

- Enclosed is a certified copy of Canadian Patent Application No. 2,348,202 for submission as Priority Document.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	BLAKE, CASSELS & GRAYDON LLP per Christopher N. Hunter (Reg. No. 52,528) Agent of Applicant
Signature	Christopher N. Hunter
Date	March 11, 2003

CERTIFICATE OF MAILING

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BLAKE, CASSELS & GRAYDON

PARCEL LIST

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Client Name Application No.	PIC	Client/Matter No. (Dkd)	Amount	Description	Date
Volvo Motor 10/073,110	CNH	55717/220		Certified Copy of Priority Document	

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This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,348,202,** on May 18, 2001, by **VOLVO MOTOR GRADERS LIMITED,** assignee of Edward McGugan, for "Slide Rail Adjustment for Grader Blade".

Agent certificateur/Certifying Officer

March 5, 2003
Date

Canada

(CIPO 68)
04-09-02

OPIC CIPO

ABSTRACT OF THE DISCLOSURE

A bearing support arrangement for a grader blade uses short stroke hydraulic cylinders to compensate for wear between slide bearings and slide rails of the grader blade. The cylinders are preferrably pressurized by grease and a grease fitting is provided for each cylinder to provide with convenient access, to allow service by the operator. Preferrably the cylinders are located in a generally closed cavity between the bearing support holder and the slide bearing.

WH-10,921CA

TITLE: SLIDE RAIL ADJUSTMENT FOR GRADER BLADE

FIELD OF THE INVENTION

The present invention relates to motor graders and in particular, relates to a bearing slide arrangement for a motor grader blade.

BACKGROUND OF THE INVENTION

The grading blade of a motor grader is subject to a host of adjustments and the nature of the mechanism and the nature of the application subjects the system to high loads. In addition, the operating conditions of the motor grader often cause material contamination and which is a particular problem for the slide mechanism of a grader blade as accelerated wear can occur.

Motor grader blades all typically include a slide adjustment for varying the position of the blade beneath the motor grader. Slide rails are provided on the rear surface of the grader blade and slide bearings are provided which engage the rails and allow the rail to slide therebetween.

A motor grader has many applications from rough grading, banking and snow plowing, to fine grading where it is desired to maintain precise grading tolerances. For rough grading applications, it is not critical if there is some excessive play due to wear between the slide rails and the bearings, however, this becomes more critical for precise applications. Most arrangements allow for some adjustment to reduce the tolerance between the bearings and the rails. Typically these systems use a number of large bolts and shims, however, the adjustment thereof is not convenient and requires specialized personnel and tools which are not normally available to the operator.

The present invention provides an alternate structure and method for supporting a motor grader blade which is easier to maintain.

SUMMARY OF THE INVENTION

A motor grader blade support arrangement comprises a blade grader with upper and lower slide rails attached to a rear surface of the blade and a blade support structure having a series of upper and lower bearing arrangements which engage the rails and accommodate longitudinal sliding movement of the blade and the slide rails. Each bearing arrangement includes a bearing support holder attached to the support structure with this bearing support holder supporting and retaining a slide bearing. At least some of the bearing arrangements include an adjustment mechanism to reduce tolerances between the slide bearings and the slide rails. The adjustment mechanism includes at least one short stroke hydraulic cylinder supported in the respective bearing holder and acting as an intermediary between the bearing holder and the slide bearing. Each hydraulic cylinder includes a grease fitting and the position of the hydraulic cylinder is adjusted using the grease fitting.

According to an aspect of the invention, the motor grader blade support arrangement has two hydraulic cylinders as part of each adjustment mechanism with these hydraulic cylinders being spaced in the length of the respective slide bearing.

In a further aspect of the invention, each bearing support holder having said adjustment mechanism includes an accessible port for each hydraulic cylinder and the grease fitting is located within the accessible port.

In yet a further aspect of the invention, the series of upper and lower bearing arrangements include at least two lower bearing arrangements, each having said

adjustment mechanism and at least two upper bearing arrangements, each having said adjustment mechanism.

The present invention is also directed to a bearing support arrangement for a slide rail of a motor grader blade. The bearing support arrangement comprises a bearing holder, a removable bearing received in the bearing holder, and at least one adjustment mechanism controlling the position of the bearing in the holder. The adjustment mechanism is received in the holder and acts on a rear face of the bearing to space the rear face of the bearing from the holder as a function of the adjustment mechanism. The adjustment mechanism includes at least one short stroke hydraulic cylinder which is normally sealed with a fixed volume of fluid. The at least one hydraulic cylinder includes a fitting for varying the fixed volume of the fluid as required to compensate for bearing wear.

In yet a further aspect of the invention, the bearing support arrangement has a bearing holder which has a U-shaped channel in which the removable bearing is received.

In yet a further aspect of the invention, the adjustment mechanism includes two short stroke hydraulic cylinders spaced in the length of the bearing holder.

In yet a further aspect of the invention, the bearing on a rear surface thereof, has a recessed area which partially receives the hydraulic cylinders.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1 is a perspective view showing a blade support arrangement for a motor grader;

Figure 2 is a side view of the blade support arrangement;

Figure 3 is an exploded perspective view of a bearing arrangement;

Figure 4 is a perspective view showing the assembled bearing support arrangement; and

Figure 5 is a partial sectional view showing the bearing support arrangement.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The blade support arrangement 2 for a motor grader is shown in Figure 1 with the slidable blade 4 offset relative to the rotatable ring gear 6. The support arrangement includes downwardly extending arms 8 which pivotally support the center pivotting structure 30 at a lower edge thereof. This support structure 30 includes associated upper bearing arrangements 52 and lower bearing arrangements 54 attached thereto.

The grader blade 4 has an upper slide rail 20 fixed to a back surface of the blade and a lower slide rail 22 fixed to the back surface. The upper bearing arrangements 52 and lower bearing arrangements 54 serve to secure the blade 4 to the support structure 30 and allow sliding movement of the blade as the slide rails slide within the bearing arrangements. The hydraulic cylinder 32 allows tilting of the support structure 30 which in turn causes tilting of the blade 4.

Details of the lower bearing arrangement 54 are shown in the exploded view of Figure 3. A bearing support holder 56 has a U-shaped channel 70 sized to receive and retain the slide bearing 58. The slide bearing 58 has a V-shaped top surface for engaging the lower slide rail. Two ports 72 are provided in the bearing holder and receive the short stroke hydraulic cylinders 80. These hydraulic cylinders include a stepped outer casing 82 having an

annular step 84. This annular step engages the U-shaped channel with the lower part of the hydraulic cylinder being received within the respective port 72.

The hydraulic cylinder includes a movable piston 86 having a ring seal 88 received in the groove 90 with the piston inserted into the cylinder 92. The cylinder is closed by the end wall 94 and the grease fitting 96 is provided in the end wall. The short stroke hydraulic cylinder is preferably filled with grease and allows adjustment of the position of the piston 86. This piston engages the rear surface of the bearing 58 and allows adjustment of the position of the bearing 58 relative to the holder. Two hydraulic pistons are provided and control the position of the bearing 58. The bearing is shown in its assembled condition in Figures 4 and 5. The piston exerts a pressure on the bearing and automatically adjusts for bearing wear.

The grease fitting 96 as shown in Figure 5 is exposed within the port 72 and allows the operator access to the fitting. As shown in the assembled view of Figure 1, the grease fittings are accessible and the operator can adjust the position of the bearings relative to the holders and thus, decrease the tolerance merely by using a grease gun to increase the pressure and thereby alter the position of the pistons 86 within the hydraulic cylinders. Thus the operator during normal maintenance or during his initial morning walk around the grader or as desired, can easily correct for any wear between the slide rails and the bearings. In this way, the operator can reduce wobble of the blade and is able to have greater control of the blade on a daily basis.

The drop in hydraulic cylinders are generally located within a substantially closed cavity between the bearing holder and the slide bearing.

The lower holder 54 has two flanges 120 and 122 and these flanges are spaced one from the other to allow the insertion of the downwardly extending arm 8. Bearings are provided within the ports 124 and 126 and thus provide for the pivotting motion of the support structure 30. The support structure 30 is mechanically fastened to the lower bearings through the outwardly extending securing flange 110 having four ports 112. Typically these will be secured by a nut and bolt arrangement. The securement of the holder can be relatively straightforward as fine adjustment of the position of the bearings is accomplished by the short stroke hydraulic cylinders.

As shown in Figure 1, the upper bearing holders is of a similar design, however, the flanges 120 and 122 are not present. The upper bearings hold the securing flange 110, and a gusset 130 is provided centrally on the flange.

It has been found that this blade support arrangement provides improved control of a motor grader blade, is convenient to adjust and is not particularly prone to maintenance. It can further be appreciated should one of the seals of the pistons fail, the result will be perhaps some leakage of grease which will merely improve the lubrication of the bearings and will not cause any substantial problems. Furthermore, there are two hydraulic cylinders per bearing holder and some maintenance of the tolerance is still achieved.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A motor grader blade support arrangement comprising a grader blade with upper and lower slide rails attached to a rear surface of the blade,
a support structure having a series of upper and lower bearings which engage said rails and accommodate longitudinal sliding movement of said blade and slide rails;
each bearing being supported and retained by a bearing support holder attached to said support structure;
at least some of said bearings including an adjustment mechanism to reduce tolerances between the bearings and the slide rails, said adjustment mechanism including at least one short stroke hydraulic cylinder supported in said respective bearing support holder and acting as an intermediary between said bearing holder and the bearing thereof, each hydraulic cylinder including a grease fitting and the position of said cylinder is adjusted using said grease fitting.

2. A motor grader blade support arrangement as claimed in claim 1 wherein said adjustment mechanism includes two hydraulic cylinders spaced in the length of the respective bearing.

3. A motor grader blade support arrangement as claimed in claim 2 wherein each bearing support holder having an adjustment mechanism includes an accessible port for each hydraulic cylinder and said grease fitting is located within said accessible port.

4. A motor grader blade support arrangement as claimed in claim 2 wherein said series of upper and lower bearing include at least two lower bearings each having

said adjustment mechanism and at least two upper bearings each having said adjustment mechanism.

5. A motor grader blade support arrangement as claimed in claim 3 wherein said series of bearings include at least two lower bearings each of which includes said adjustment mechanism and at least three upper bearings all of which have said adjustment mechanism.

6. A motor grader blade support arrangement as claimed in claim 5 wherein said hydraulic cylinders are filled with grease under pressure in excess of 3000 psi.

7. A motor grader blade support arrangement as claimed in claim 1 wherein each hydraulic cylinder is of a diameter in excess of 1.5 inches.

8. A motor grader blade support arrangement as claimed in claim 7 wherein the operating stroke of each hydraulic cylinder is less than 1 inch.

9. A motor grader blade support arrangement as claimed in claim 6 wherein each hydraulic cylinder is includes a stepped outer casing and said bearing holders include ports which partially receive said hydraulic cylinders with the steps thereof abutting said bearing holder.

10. A motor grader blade support arrangement as claimed in claim 9 wherein each bearing is recessed on a back surface thereof and cooperates with said bearing holders such that said hydraulic cylinders are captured between their respective bearing and the respective bearing holder.

11. A bearing support arrangement for a slide rail of motor grader blade comprising a bearing holder, a removable bearing received in said holder and at least one

adjustment mechanism for varying the position of said bearing in said holder, said adjustment mechanism being received in said holder and acting on a rear face of said bearing to space said rear face from said holder as a function of said adjustment mechanism, said adjustment mechanism including at least one short stroke hydraulic cylinder which is normally sealed with a fixed volume of fluid, said at least one hydraulic cylinder including a fitting for varying said fixed volume of fluid as required to compensate for bearing wear.

12. A bearing support arrangement as claimed in claim 11 wherein said bearing holder includes a 'U' shaped channel in which said removable bearing is received.

13. A bearing support arrangement as claimed in claim 11 wherein said adjustment mechanism includes two short stroke hydraulic cylinders spaced in a length of said bearing holder .

14. A bearing support arrangement as claimed in claim 13 wherein each hydraulic cylinder includes an exposed grease fitting through which grease is inserted to pressurize said cylinder and adjust said bearing.

15. A bearing support arrangement as claimed in claim 11 wherein said bearing on a rear surface thereof facing said bearing holder having a recessed area which partially receives said at least one hydraulic cylinder.

16. A bearing support arrangement as claimed in claim 15 wherein said bearing and said bearing holder cooperate to generally surround said adjustment mechanism while exposing a rear surface of said adjustment mechanism through a port in said bearing holder.

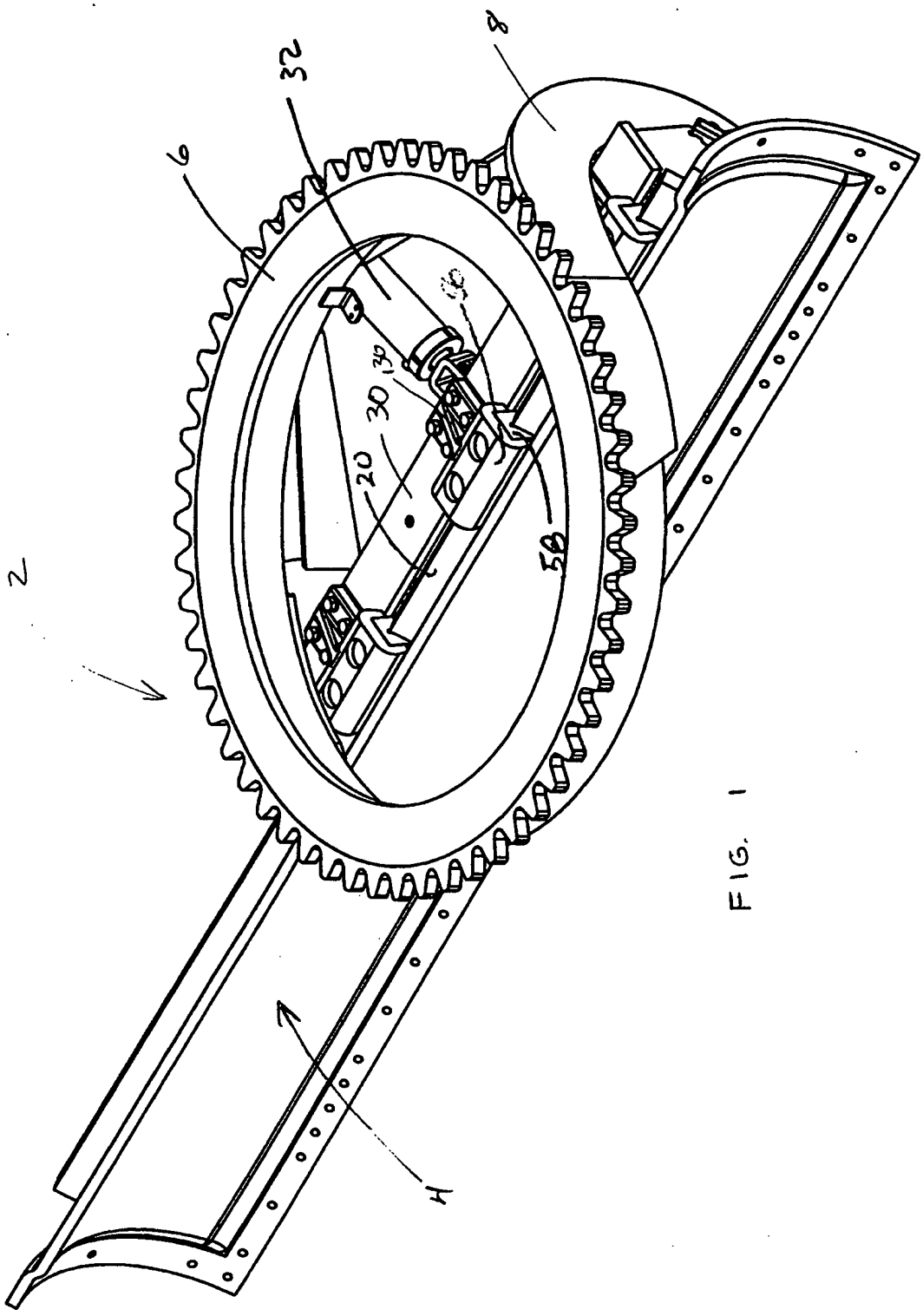

FIG. 1

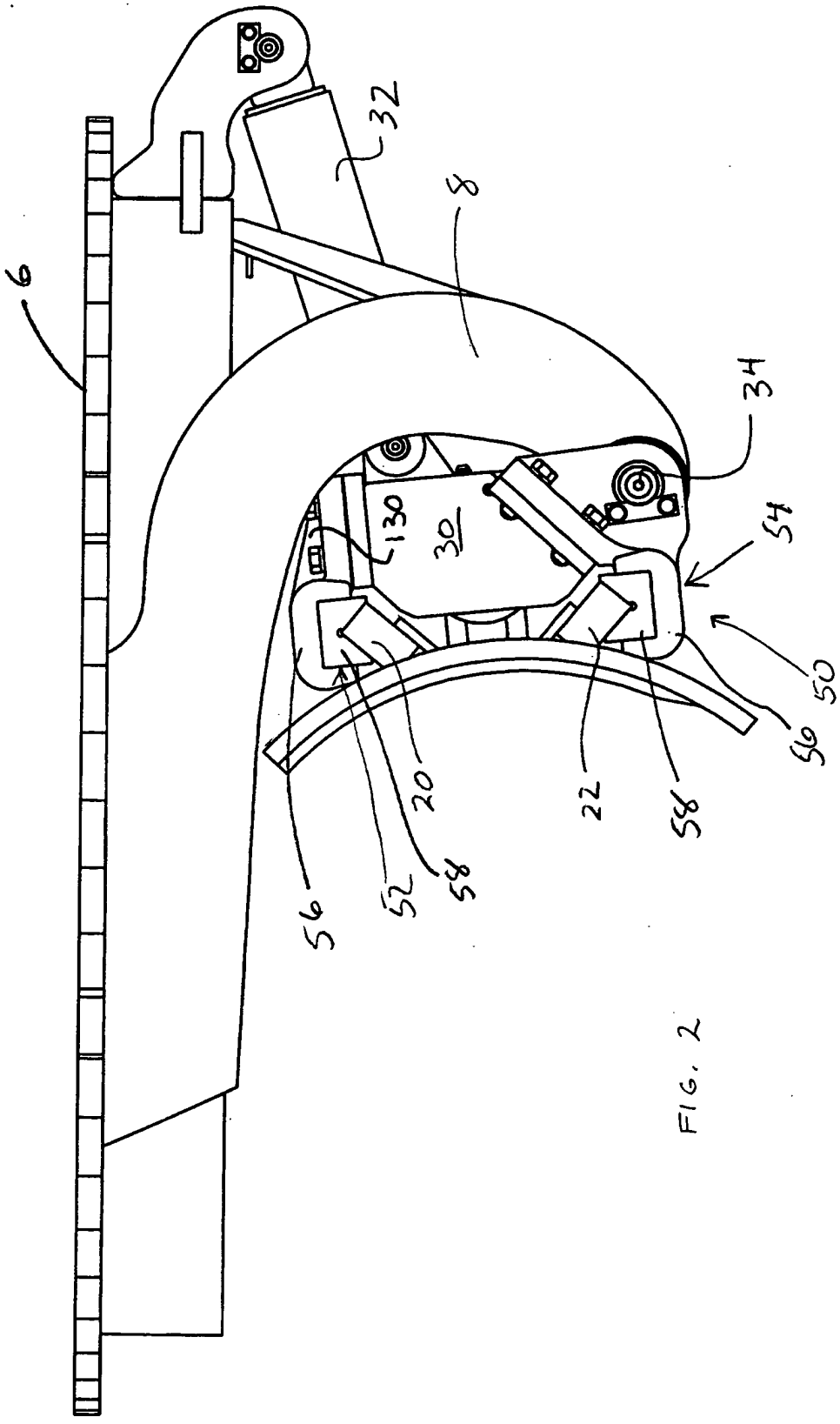

FIG. 2

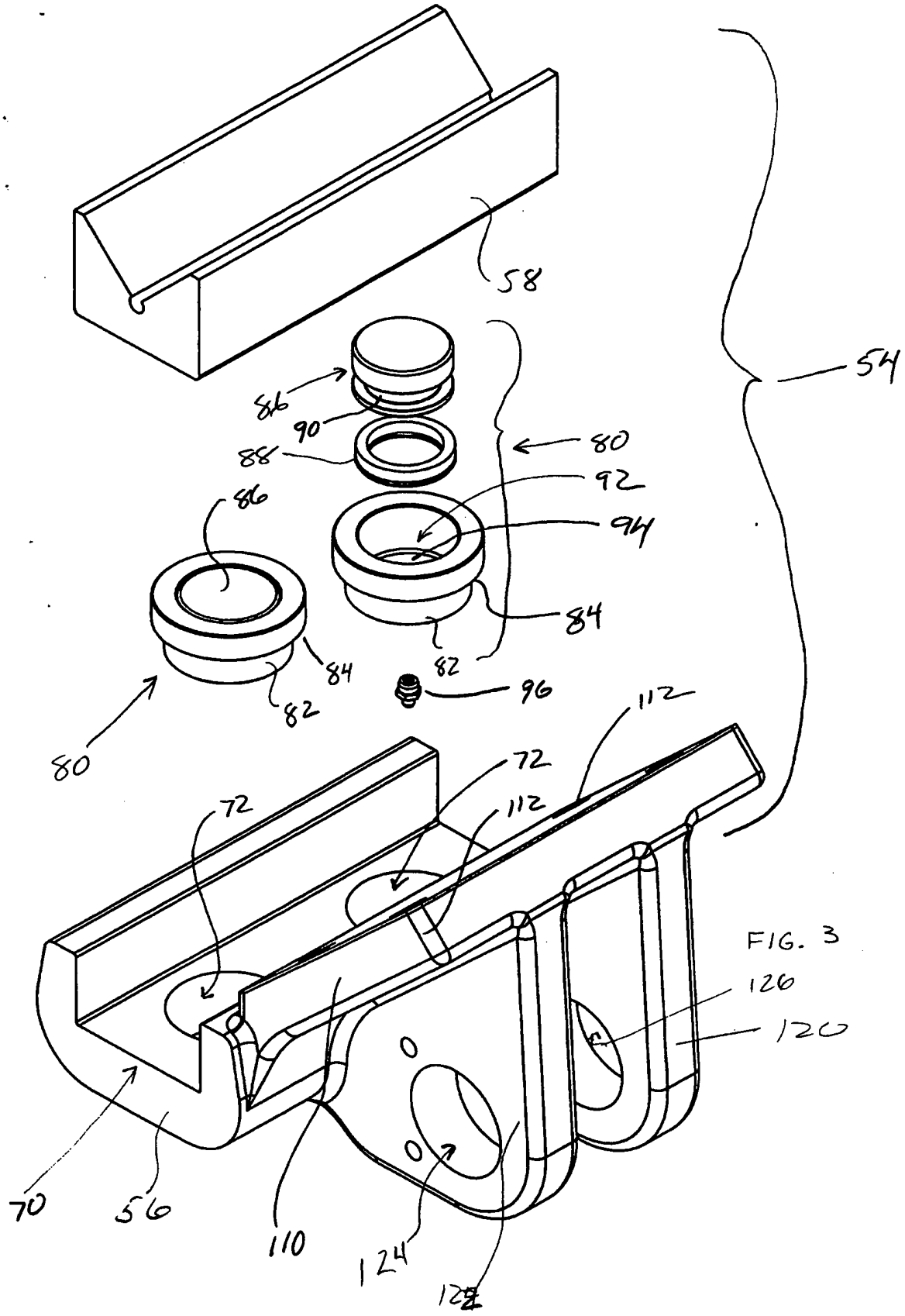
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FIG. 3

FIG. 4

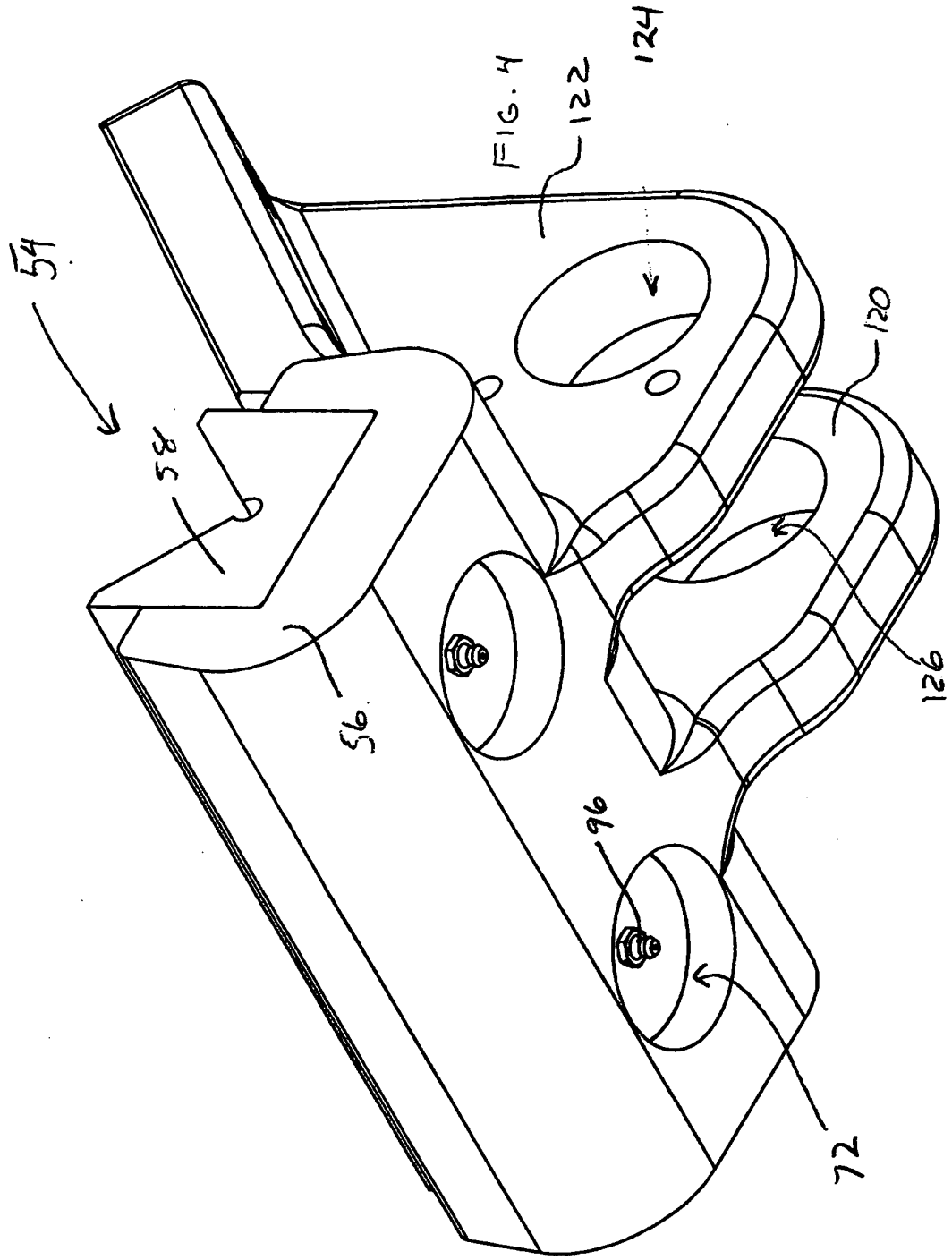

FIG. 5